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RURAL ELECTRIFICATION ADMINISTRATION

March 1956

Background Information On Atomic Energy Developments

Are atom-powered rural electric systems a distant dream? Or are they a practical possibility, capable of realization soon or in the foreseeable future?

Rural electric cooperatives financed by REA are among the front runners in trying to find answers to these questions. Three of seven proposals to participate in the small reactor development program of the Atomic Energy Commission came from electric cooperatives - the Rural Cooperative Power Association of Elk River, Minnesota, a federation of six REA-financed electric distribution cooperatives; Wolverine Electric Cooperative of Big Rapids, Michigan, a federation of three distribution cooperatives; and the Chugach Electric Association of Anchorage, Alaska, a distribution cooperative.

The astounding upward trend in demand for rural power since the establishment of the Rural Electrification Administration 20 years ago gives particular urgency to some of the atomic power questions. With farm power consumption on REA-financed systems mounting sharply, the possibility of exhausting supplies of fuel for producing electricity by conventional means no longer seems as remote as it once did.

Rural electric cooperatives and REA early recognized the potential importance of nuclear power in meeting future power needs. In order to help its borrowers take advantage of any developments in the field of atomic energy applicable to their needs, REA some time ago set up a small staff of security-cleared engineers to work in a liaison capacity with AEC.

Authorities Are Confident

Many and difficult problems still must be overcome before the atom can be harnessed to supply rural areas with power at rates competitive to conventionally-produced electricity. High cost of building atomic power plants is a big problem, for example, as is the necessity for developing safeguards against the perils of atomic radiation. Another limiting factor is the shortage of scientists trained in the field.

While cautioning against easy over-optimism, authorities such as W. Kenneth Davis, director, Division of Reactor Development, Atomic Energy Commission, have expressed confidence that following through on known scientific and engineering principles will yield economic atomic power in time. They also recognize the possibility that new ideas, discoveries and inventions may perhaps result eventually in really cheap electric power from the atom.

Just a little more than 13 years ago the first atomic reactor was completed. It had a power level of two watts - just about enough to light a flashlight.

Today power produced by nuclear fission is in actual use in a few places. For one thing, it drives the submarine Nautilus. Power from a submarine prototype reactor has flowed into homes, farms and industries of upper New York State. Another reactor has lighted the town of Arco, Idaho.

Reactors do not produce electric energy directly. Instead they produce heat which, as in a conventional plant, produces steam which operates a turbine. Thus the chief opportunity to cut costs of electric power through atomic energy at present rests in producing and transporting atomic fuel and putting it to work.

TWO BIG GROUPS INVOLVED

Since the cost of building and maintaining turbogenerators constitutes a large part of the expense of producing electric power, nuclear plants now being developed do not hold the promise of really cheap power. Atomic power plants will not make modern hydroelectric and steam plants obsolete. In the light of present knowledge, authorities expect that in this country nuclear power will supplement rather than supplant conventionally-produced electricity.

Two major American business groups are mainly involved in the atomic electric power picture to date. One consists of the utilities, both large and small, that will ultimately vend the electricity produced. They feel they must have atomic know-how for their future operations and are beginning to invest accordingly in research. The other group consists of the manufacturers of generating equipment, most of which now produce conventional equipment and presumably will ultimately produce nuclear reactors for sale to the utility industry.

To enable these and related American industries to get to work in this new field, the Atomic Energy Commission in January 1955 announced a Power Demonstration Reactor Program. Under this program the Commission invited proposals to build atomic plants of relative large size.

Large plants were specified in this first program. That was because the Commission believes that "economic nuclear power will first be achieved on a substantial scale in this country with such large plants." However, such large nuclear power plants would be far too big for many thinly settled areas in the United States. Also, large nuclear power plants are not adapted to the needs of underdeveloped countries.

WHERE CO-OPS FIT IN

Because of this national and international need for smaller nuclear power plants, the AEC issued another invitation for power demonstration reactors in September 1955. This second invitation called for proposals in three capacity ranges - 5,000 to 10,000 kilowatts, 10,000 to 20,000 kilowatts, and 20,000 to 40,000 kilowatts. This is the program in which the REA cooperatives hope to participate. The Elk River Co-op proposes a boiling water reactor and a plant with an electrical capacity of 22,000 kw. The Wolverine cooperative proposes an aqueous homogeneous reactor with a capacity to produce 10,000 kw. Chugach cooperative in Alaska proposes a sodium-cooled, heavy water moderated reactor and a plant with an electrical capacity of 10,000 kw.

The small reactor program is in part a follow-up of a recommendation made by REA Administrator Ancher Nelsen to Chairman Lewis L. Strauss of the AEC. In April 1955, the REA Administrator wrote Chairman Strauss urging consideration of proposals in the 5,000 to 20,000 kw range, in an effort to bring the smaller reactors into a competitive cost position.

Cooperatives and municipalities as well as commercial enterprises were eligible to submit proposals for the small reactor program. Nelsen offered REA's service to borrowers, pointing out that submission of a proposal in response to the AEC invitation would require a coordinated effort by the borrower, its engineer, a manufacturing firm and REA.

Proposals were accepted by AEC through February 1, 1956.

Basis For Participation

In a recent speech, Davis outlined the basis for participation in the small reactor program. Some extracts from his speech follow:

"The hope is that the Commission will be able to accept one or more proposals in each size range (5,000 to 10,000 kilowatts; 10,000 to 20,000 kolowatts, and 20,000 to 40,000 kilowatts.) However, all three ranges may not be represented in the final selections because each proposal will compete with all others.

"This invitation specifically sets forth the possibility of the Commission paying for andretaining title to all or part of the reactor plant. But AEC hopes that it will not be necessary for the Commission to pay for an own any plant. In view of the size of the reactors under consideration it is believed desirable to at least consider Government ownership as an upper limit. For these small reactor plants, as for the larger ones, assistance provided by the Commission is to be 'closed ended'.

"Under this concept the Commission may extend various forms of assistance. But, once these have been agreed to, the dollar amount of assistance to be provided by the Commission is fixed. The proposers have the full technical and economic responsibility. If the project costs more than planned, the extra amount comes out of their pockets. If it can be done for less, then they are ahead by just that much.

"The Commission will consider payment for technological information arising from the development, design, construction, and operation of these plants. The Commission will also consider waiver of charges for nuclear fuel for 5 years from the issuance of an operating license.

"A key consideration in the program is that the proposed reactors must be types which show promise of producing economic nuclear power and that each prototype constructed must contribute in a definite and substantial way to the over-all development of that type of reactor. What AEC is seeking is to aid the development of new types and sizes of power reactors - not to build power plants for the sake of having them.

"In addition to the exploitation of known scientific and engineering principles which seem capable of giving us economic nuclear power in time, we can anticipate new ideas, discoveries and inventions which will perhaps result in really cheap power - not just competitive power."

Big Reactors Being Developed

Know-how being gained in the AEC program for the development of large-scale power reactors might well help in the small-scale program. Five large-scale reactors are in various stages of planning or development.

Scheduled for completion in 1957 is a pressurized water reactor being built for AEC by the Westinghouse Electric Corporation at Shippingport, Pennsylvania. It will fuel a 60,000 kw generator being built by the Duquesne Power and Light Company. Estimated cost is $37,700,000 for the reactor and $10,000,000 for the turbogenerator.

Slated for completion in 1958 or 1959 is a sodium graphite reactor for a plant with an electric capacity of 75,000 kw. It is to be built by the Consumers Public Power District of Columbus, Nebraska, at an estimated cost of $13,500,000, for the reactor and $10,800,000 for the turbogenerator.

Yankee Atomic Electric Company of Massachusetts, proposes to build a pressurized water reactor to fuel a 134,000 kw generator. Tentative date for completion is some time in 1959-1960. Estimated cost is $19,300,000, for the reactor and $6,700,000 for the turbogenerator.

Power Reactor Development Company, a group which includes the Detroit Edison Company, has plans for a fast breeder reactor to power a 100,000 kw generator. Cost is estimated at about $45,000,000 for the reactor and $9,000,000 for the turbogenerator. This is scheduled for completion in 1959-1960.

Nuclear Power Group, which includes the Commonwealth Edison Company, hopes to finish a boiling water reactor to operate an 180,000 kw generator in the Chicago vicinity during 1960. The cost is expected to be about $34,200,000 for the reactor and $10,800,000 for the turbogenerator.

Consolidated Edison Company expects to complete a pressurized water reactor at Indian Point, New York, in 1960. This reactor, with the aid of conventional fuel for superheating, will power a 250,000 kw generator. Estimated cost of the total plant is $55,000,000.

What Other Co-ops Are Doing

A number of individual REA co-ops and groups of co-ops have taken steps to get first-hand information on atomic energy developments. For example, a group of five distribution cooperatives comprising the Seminole Electric Cooperative, Inc., of Madison, Florida, is conducting a study to determine if a nuclear power plant can be developed to produce electricity at costs below those current in Florida, and to determine the suitability of small plants with a 10,000 kilowatt capacity for use in rural areas. REA is observing and assisting in the Seminole study and will report to REA borrowers on developments.

In all 14 REA electric borrowers or groups of borrowers have "access agreements" with AEC to get information on developments in atomic energy. In addition to Seminole, Rural Cooperative Power and the Wolverine Cooperative, these are:

Central Kansas Electric Cooperative, Inc., Great Bend, Kansas; Cooperative Power, Inc., Piqua, Ohio; Corn Belt Power Cooperative, Humboldt, Iowa; Kansas Electric Cooperative, Topeka, Kansas; Ohio Rural Electric Cooperatives, Inc., Columbus, Ohio; Oklahoma Statewide Electric Cooperative, Inc., Oklahoma City, Oklahoma; Puerto Rico Water Resources Authority, San Juan, Puerto Rico; Texas Electric Cooperatives, Inc., Austin, Texas; Wisconsin Electric Cooperative, Madison, Wisconsin; Minnkota Power Cooperative, Inc., Grand Forks, North Dakota; and Plains Electric Generation and Transmission Cooperative, Inc., Albuquerque, New Mexico.

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